

REMARKS

Applicants request favorable reconsideration and allowance of this application in view of the foregoing amendments and the following remarks.

Claims 1, 2, 5, 8, 10, 11 and 19 are pending in this application, with Claims 1, 10 and 19 being independent.

Claims 3, 4, 6, 7, 9, 12-18 and 20 have been cancelled without prejudice. Claims 1, 2, 5, 8, 10, 11 and 19 have been amended. Applicants submit that support for the amendments can be found in the original disclosure at least, for example, in paragraph [0058] and the description corresponding to Fig. 2. Therefore, no new matter has been added.

The specification was objected to due do some typographical errors. Appropriate corrections have been made.

Claims 4-9, 18 and 29 were objected to under 37 CFR 1.75(c) as allegedly being in improper form. Without agreeing with the basis for the Examiner's objection, Applicants have amended the claims to make it even more clear that other claims are being referred to in the alternative. Withdrawal of this objection is requested.

Claims 19 and 20 were rejected under 35 U.S.C. § 101 because the claimed invention is directed to non-statutory subject matter. Claim 19 has been amended to recite a computer-readable storage medium which Applicants submit is statutory subject matter. Withdrawal of this rejection is requested.

Claims 1-3, 5-8, 11-17, 19 and 20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Suzuki (U.S. Patent No. 5,859,921) in view of Ando (U.S. Patent No. 5,008,946). Claim 4 was rejected under Section 103 as being obvious over Suzuki and Ando ,

and in further in view of Kinjo (U.S. Patent No. 5,629,752). Applicants respectfully traverse these rejections for the reasons discussed below.

As recited in independent Claim 1, the present invention is directed to a human eye detection method. In particular, it is directed to a method for determining whether or not a candidate eye area is a real eye area. The method of Claim 1 can eliminate an image area like that shown in Fig. 2 as a candidate eye area, as discussed in paragraph [0058]. The invention of Claim 1 is based on the observation that a neighborhood region of an actual eye has fewer dark areas than, for example, an image area as shown in Fig. 2. Accordingly, Claim 1 sets an area to be judged with step c), determining a neighborhood region in the image of a candidate eye area, and then calculates a characteristic value of the neighborhood region using steps d) and e). In particular, the claimed method calculates the neighborhood region's size S and detects dark areas in the neighborhood and counts the number of dark areas N . The method of Claim 1 then uses this characteristic value relating to the number of dark areas in a neighborhood region, i.e., the ratio of dark areas N to the size S of the neighborhood region, in step f) to determine whether the candidate area is a real eye area. In particular, Claim 1 recites comparing the ratio N/S to a predetermined first threshold value and if the ratio N/S is smaller than the first threshold, the candidate eye area is judged to be a real eye area, else the candidate eye area is judged to be a false eye area. With these features, detection of real eye areas and the elimination of candidate eye areas like that shown in Fig. 2 can be done with high accuracy.

Applicants submit that the cited art fails to disclose or suggest at least the above-mentioned features of the present invention recited in Claim 1. Suzuki discloses a technique for detecting an eye area, but that patent fails to disclose or suggest a method or structure that will exclude image areas like that of Fig. 2 from the candidate eye areas. More specifically, Suzuki

shows a process for identifying an eye area in Fig. 9. The size and shape of an eye based on histogram data are used to identify an eye area. See col. 21, lines 42-64. However, that patent does not disclose or suggest using a ratio of dark areas in a neighborhood region of a candidate eye area to judge whether it is a real eye area. That is, Suzuki does not disclose or suggest steps d) and e) of Claim 1, to determine the ratio N/S, or step f) of Claim 1, comparing the ratio N/S to a threshold to judge whether it is a real eye area.

The Examiner asserts that Ando discloses obtaining the total number of pixels in a region, obtaining the number of black pixels, comparing the ratio to thresholds and, if the ratio does not lie within a range, deeming the area to be not correctly detected as an eye region. The Examiner cites portions of Col. 18. However, the portions of Col. 18 in Ando that the Examiner cites do not describe detection of a pupil or a portion of an eye. Instead, the cited portions are used to explain Fig. 8b of Ando and relate to setting the threshold value TH used for detection of pupils. Col. 18, lines 3-9 and 53-55. That is, the discussion in Ando regarding the number of black areas concerns the setting of a threshold TH. The actual process used in Ando to detect a pupil is performed after the threshold TH has been determined. Col. 18, lines 58-60. The actual process for detection of the pupils merely involves digitizing the image data in a region, using the threshold TH and calculating the dimensions of black regions consisting of the resulting pixels, and determining whether the calculated dimensions coincide with the dimensions of human eyes. Col. 18, lines 61-68.

In other words, Ando discloses using a ratio of black pixels to set a threshold value TH (i.e., evaluation standard). In contrast, the invention of Claim 1 uses a ratio of dark areas to determine a characteristic value N/S and then compares that value to a threshold. Accordingly, Applicants submit that the cited art fails to disclose or suggest at least the features of calculating

a neighborhood region's size S, counting a number of dark areas N, and comparing the ratio N/S to a threshold, wherein if the ratio is smaller than the threshold the candidate eye area is determined to be a real eye area and otherwise it is determined to be a false eye area, as recited in independent Claim 1.

Further, Suzuki discloses a technique to easily extract an eye area even when a driver wears glasses. Col. 22, line 51 through col. 23, line 19. It is not readily apparent whether the technique of Ando, which simply determines whether the dimensions of a black region coincide with those of human pupils, could easily extract an eye area even if a driver wears glasses. Therefore, Applicants submit that it would not have been obvious for one skilled in the art to substitute the method of eye area detection in Suzuki with that of Ando.

For the foregoing reasons, Applicants submit that the present invention recited in Claim 1 is patentable over the art of record. The other independent claims recite features similar to those of Claim 1 discussed above, and are believed to be patentable for reasons similar to those discussed regarding Claim 1.

The dependent claims are believed patentable for at least the same reasons as the independent claims, as well as for the additional features they recite.

For the foregoing reasons, this application is believed to be in condition for allowance. Favorable reconsideration, withdrawal of the outstanding objections and rejections, and an early Notice of Allowance are requested.

Applicants' undersigned attorney may be reached in our Washington, D.C. office by telephone at (202) 530-1010. All correspondence should continue to be directed to our below-listed address.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'B. L. Klock', is written over a horizontal line.

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